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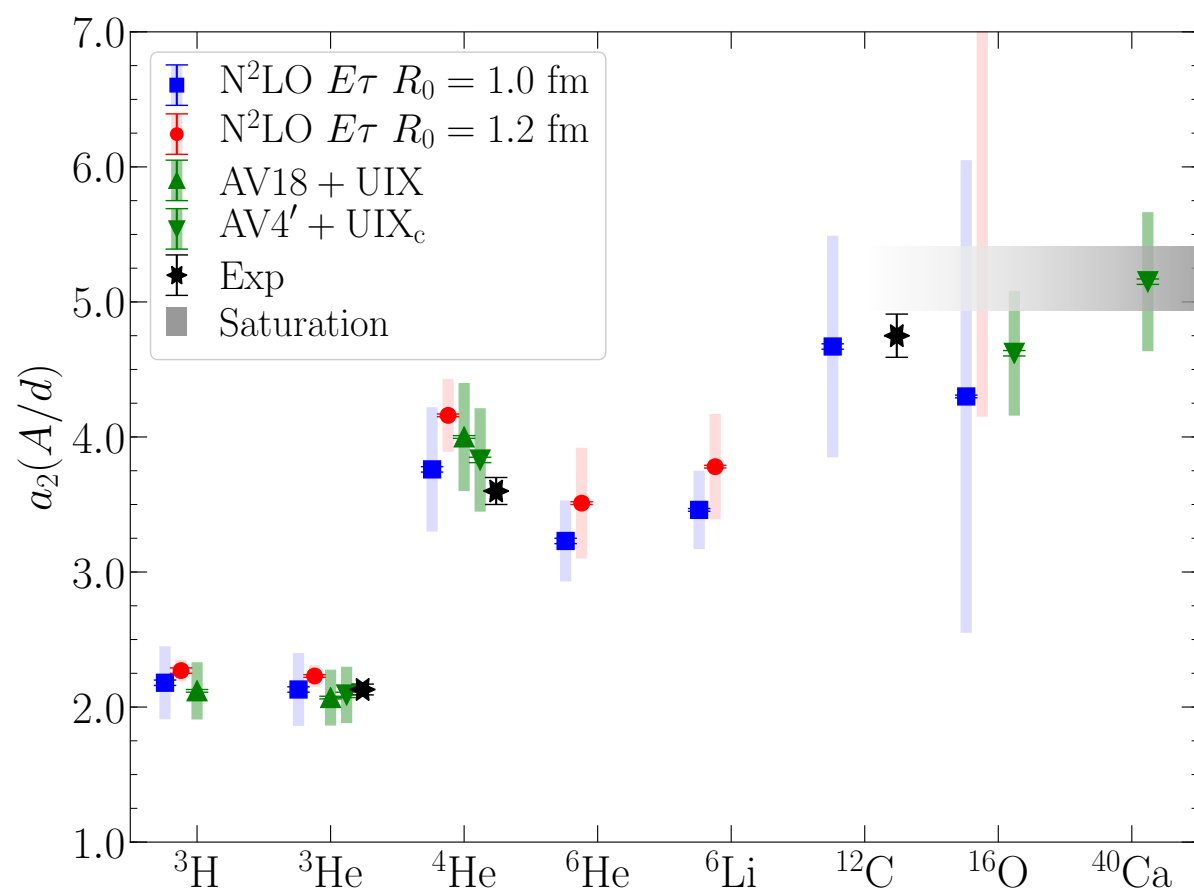
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# *Ab initio short-range-correlation scaling factors in nuclei up to $A=40$*

## *Objectives*

- We use quantum Monte Carlo methods to calculate the short-range-correlation scaling factor  $a_2$  in nuclei up to  $^{40}\text{Ca}$  as ratio of two-nucleon coordinate-space densities in the limit of short interparticle distance.
- We employ both phenomenological potentials and local chiral interactions up to next-to-next-to-leading ( $\text{N}^2\text{LO}$ ) order for different values of the cutoff  $R_0$ .



Short-range-correlation scaling factors for selected nuclei up to  $A=40$ . Available experimental data are also shown.

## *Impact*

- The short-range-correlation (SRC) scaling factor for a nucleus  $A$  relative to the deuteron  $a_2(A/d)$  and relative to  $^3\text{He}$   $a_2(A/^3\text{He})$  is calculated from ab initio low-energy nuclear theory in light and medium-mass nuclei, with the first predictions for  $^6\text{He}$ ,  $^6\text{Li}$ ,  $^{16}\text{O}$ , and  $^{40}\text{Ca}$ .
- Results are largely scheme and scale independent, *i.e.*, they do not depend on the specific nuclear potential, even though the two-nucleon densities from which  $a_2$  is extracted are manifestly scheme and scale dependent.
- The quantum Monte Carlo estimates of  $a_2$  agree with the available experimental information in the mass range investigated, even for a simplified phenomenological interaction that does not include the tensor force.
- The employed framework further predicts that the EMC effect and SRC scaling factors have minimal or negligible nuclear isovector corrections.
- Using the the empirical linear relationship between the slope of the EMC effect and SRC scaling factors, the slope of the EMC effect is estimated for  $^6\text{He}$ ,  $^6\text{Li}$ ,  $^{16}\text{O}$ , and  $^{40}\text{Ca}$ .

## *Accomplishments*

J.E. Lynn, D. Lonardoni, J. Carlson, J.-W. Chen, W. Detmold, S. Gandolfi, and A. Schwenk, [J. Phys. G: Nucl. Part. Phys. 47, 045109 \(2020\)](https://arxiv.org/abs/2004.04510)